Factors Related to Smoking in College and Not in College Young Adults

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ABSTRACT

This study sought variables associated with current smoking for young adult males and females in college compared with those not in college. A self-administered questionnaire was completed by a cohort of 1,270 young adults (ages 20–24) who have been followed from grade 6 for 10 years. Both bivariate and multivariable analyses of demographic characteristics, family and friends smoking and other drug use, psychosocial factors and attitude, and lifestyle factors were conducted. In the bivariate analyses, male and female college students had many variables in common, as did not-in-college males and females. In the multivariable analysis, similar variables for male and female college smokers were found, but depression was only important for males. For male and female not-in-college smokers, while some similarities were found (amount of money and expectation for continued smoking), there were also differences: the male model included friends smoking and number of tobacco products, whereas the female contained attitude towards smoking and social conformity. There are similarities between college and non-college models, and between male and female models in both groups, but for anti-smoking programs it may be important to focus on the differences in the models, which may have to be tailored to level of education as well as gender.

INTRODUCTION

In spite of substantial progress in reducing the prevalence of smoking in the Canadian general population, the prevalence of smoking among some groups still is high.[1,2] From 1999 to 2003, there was a decrease in the prevalence of current smoking among young adults (20–24), from 35% to 30%, with little difference between males and females. However, this age group is still smoking at a considerably higher rate than the general Canadian population.[2,3] The group of young adults who are currently not in college is smoking at almost double the rate for the same age group who are currently enrolled in college (40% vs. 21%, OTRU CTUMS analysis, personal communication, 2004). The difference in smoking prevalence between those in college and those not in college also is found in the U.S.; in 2003, the U.S. National Survey on Drug Use and Health reported past month use to be 45.3% among not in college young adults, compared to 31.4% among college students (ages 18–22).[4]

The high rates of smoking among young adults are a concern because it is not known whether the cohort of young adults will quit or continue to smoke as they age. It is not clear why there are differences in prevalence between those who are currently in school compared to those who are not. Understanding tobacco use in this age group and examining the variables related to use can provide important background information for the design and implementation of effective interventions to reduce smoking.

We know some things about smoking in young adults: prevalence is higher among

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those whose parents smoke,[11] those whose friends smoke,[12] among those with lower levels of education,[13] and among those with lower reported earnings.[14] High-risk behaviors and non-participation in athletics also increase the likelihood of being a smoker for young college students.[15] Being married and frequent religious attendance are protective for smoking uptake in adolescents and young adults.[16,17] In addition, young adults may be less likely to quit smoking if they start smoking before 13 years of age,[18] are more dependent on nicotine,[18,19] have more friends who smoked,[20] are married to a smoker,[20] and/or have lower educational achievement.[21]

Little is known about the relationship of psychosocial variables to smoking in young adults. However, some of the findings from adolescence may be relevant. Stress and associated depression are important factors in smoking initiation and other substance abuse in adolescents.[22] Psychosocial factors that protect adolescents from smoking include increased coping,[23] increased self-esteem,[5,9,24] increased social support,[5,6,25] increased mastery,[5,6,10,22,26] decreased social conformity,[5,10,27] and decreased rebelliousness.[5,6,10,28,29] Although some studies have found knowledge of negative health effects to be a protective factor for smoking,[6,28] much of the literature does not support this relationship.[30] Personal health concerns appear to motivate young smokers as well as adults.[6,31] More positive attitudes toward smoking and/or smokers have also been shown to increase the likelihood of smoking.[5,6,10,32,33] In addition, paternal, maternal, sibling and friends smoking have been found to be associated with smoking, as has paternal and maternal disapproval of smoking.[5,6,23]

For the past ten years, we have been tracking a cohort of students who were in grade 6 at inception. This group has been followed in grades 8 and 11, and as young adults in their early 20s.[5–10] The purpose of the analyses reported here was: 1) to examine the bivariate relationships of smoking history, smoking environment, lifestyle, and psychosocial and attitudinal factors to current smoking, as compared to not smoking, for young adults in college and not in college; 2) to determine which of these variables were important in a parsimonious backward elimination regression model; and 3) to determine whether the models were different for males and females in college and not in college.

METHODS

Study Design

The study was approved by the Review Board for Health Sciences Research Involving Human Subjects of the University of Western Ontario in January of 1991 and was approved again for each of the three follow-ups in 1995, 1998, and 2000. In addition, the project was approved by the School Board from Scarborough, Ontario, in 1993. A total of 107 schools participated in the spring of 1993, when baseline data was collected in grade 6 classes. There were 76 items on the questionnaire, grouped into 16 topic areas and scales. The specific items were based on questions from other questionnaires on tobacco and on the use of alcohol and other drugs. Some items were developed, as there were not existing age-appropriate materials available. The first version of the questionnaire was refined by a pilot study on students in the London (Ontario) School Board. The refined questionnaire was used with classes of grade 6 students, and the same questionnaire was used at follow-ups in grades 8 and 11.[5,6,10]

The survey administered in grades 6 and 8 was usually completed in a school classroom under the supervision of our test administrators; one hour was allowed for completion of the questionnaire. In grade 11 and in the young adult follow-up, questionnaires were mailed to or hand delivered to students individually and return envelopes provided for the completed questionnaire (see below for details).

Students were tracked in the years between administrations of the survey, using a series of predetermined contacts. First the original school was contacted. If students had left a school, their new school was found, or they were contacted at their home address, or, failing this, a pre-designated "contact person" was called. After the students left school, and often left home, annual tracking was continued. Participants were mailed a letter and asked to confirm their address, telephone number and contact person. Non-respondents were followed up by phone and /or email. If no response was forthcoming, Internet resources such as Canada 411 and university/college student lists were used. The Ontario Student Assistance Program and the military were contacted for possible addresses and/or phone numbers. Further details are given in Mills et al .[34]

The Young Adult Questionnaire

To update the questions for the young adult age group, volunteers were sought from two "young adult" help centers in London, Ontario. These 20 individuals were not part of the original cohort. The original items of the proposed questionnaire were provided to the participants. A qualitative group discussion was conducted in the volunteers made suggestions for items to be added or for changes to be made in the attribution (e.g., for the stress measure, whether the event happened to the individual him or her self, to a member of the individuals family, or to a friend or significant other).

Volunteers for a pilot study were then solicited by posters at the two "young adult" help centers, and at a university and community college; advertisements were placed in the student newspapers at the university and community college. A pilot test of the revised questionnaire was carried out.

For the stress scale, of the 18 questions in the original questionnaire, 10 were removed and 18 were added. In addition one question was split into two, and one question was split into three. The result is that the young adult questionnaire contained 29 questions to measure stress. There were two questions on illicit drug use: how many of your friends use marijuana or other illegal drugs, and how many times have you used the following drugs: (i) marijuana, (ii) cocaine, (iii) heroin, (iv) ecstasy, (v) acid, (vi) mushrooms ,(vii) amphetamines, (viii) steroids, and (ix) inhalants.

The modified young adult questionnaire contained 88 items and included three questions with possible open-ended responses, give other reasons for smoking or not smoking, please tell us what other things would make people your age less likely to smoke, and are there other things you think we should know about young adults and smoking, drinking or health?

Two questions were used to assess students' smoking status: Have you ever smoked?; and, in the past 30 days, did you smoke any cigarettes? The outcome was defined as current if both questions were answered Yes, or non-smoker if (i) No was the response to the first question and there was no answer for the second question, (ii) Yes was the response to the first question and "No, I stopped temporarily" was the answer to the second question, or (iii) Yes was the response to the first question and "No, I quit smoking" was the answer to the second.

In addition to questions on cigarette use, the survey also included questions on demographics, lifestyle and social involvement (participation in organized team sports and non-team sports, volunteering, and involvement with religious organizations), health and weight, work status, alcohol and illicit drug use, parental education and occupation, and parental, sibling, and peers smoking. A set of ten scales appropriate for this age group was used to measure the degree of life stress,[35] depression,[36] coping , self-esteem, social support, mastery, social conformity, risk-taking, anger and attitudes toward/against smoking and smokers.[5,9] Attitude scale also included eight sub-scales: appearance, weight, expensive (Is smoking expensive?), addiction, self-image, health (A woman should not smoke when she is pregnant; Smoking makes you/people poor at sports; and, I don't want to smoke because I am allergic to smoke), second-hand smoke, and reasons to smoke.

Respondents had to answer at least 80% of the items on each scale and subscale in order for the scale to be included in the analysis. This criterion was not applied to the measure of life stress, because a response was not required for every item.

Both the original and the young adult questionnaires are available on request.

Procedures for Data Collection

The young adults were sent a copy of the questionnaire at the contact address used in the latest tracking, which took place within the preceding one to two years. This package included a postage-paid, self-addressed envelope. Each participant was offered twenty-five dollars for his or her time in completing the questionnaire. If the questionnaire was not returned within one month, they were contacted by telephone. A second questionnaire was sent, if requested. For respondents in the Toronto area, an offer was made to have the completed questionnaire picked up at their home address. If contact was not made through the available telephone number, the pre-designated contact person was called. If these efforts failed, current telephone numbers and/or addresses were sought from Internet sites such as Canada411 and Canada Post. Universities and community colleges were contacted to see if they had publicly-accessible student lists. Current participants were sent lists of individuals who had not been found to see if they had current contact information; a reward of ten dollars was offered for information that led to a successful contact. The same procedures were followed for all of the members of the cohort, whether they were in college or not. In fact, we did not know their status until the questionnaires were returned to us.

Analyses

Analyses of bivariate relationships were conducted for each gender by college status group using chi-square and t-tests. College status was determined by a question about whether one was currently in school and included only those who responded that they were in a college or university (not a trade school or community college). Cronbach's alpha was calculated for each scale: life stress (.894), depression (.895), coping (.581), self-esteem (.899), social support (.777), mastery (.779), social conformity (.868), risk taking (.829), anger (.850), and attitudes toward smoking and smokers (.630).

To establish parsimonious models for each of the four genders by school groups, backward elimination was used with logistic regression models. The initial model included those variables that were significant at $p \leq 0.05$ in the bivariate analyses. The level for keeping a variable in the model was set at 0.10, the value recommended for backward elimination in multiple regression[37] and similar to the value recommended for forward selection in logistic regression.[38] In the final multivariable model, variables with $p \leq 0.05$ were considered statistically significant, whereas variables with $0.05 \leq p \leq 0.10$, although NOT statistically significant in themselves, were considered useful for increasing the accuracy of estimation of the other variables.

After the models had been established, the predicted probability of current smoking was calculated for each individual; the prior probability was set at 0.5. The percentage of correct classification was then determined. All analyses were performed using SAS version 8.2.[39]

RESULTS

Of the original 1,614 who responded to the baseline questionnaire, 1,270 completed the questionnaire as young adults. Participation rates for all four data collection points can be found in Table 1.

Fourteen individuals did not provide complete data. There were 668 participants in college—277 males and 391 females. Of the 588 not in college, there were 310 males and 278 females. Among the respondents, 32.8% were current smokers (regular and occasional) and 67.2% were non-smokers. Males were more likely to be current smokers (35.6%) than were females (30.4%) and this difference is statistically significant ($p=0.046$). Female non-smokers were significantly different from male non-smokers. Females were more likely to be non-smokers (69.6%) than males (64.4%).

Bivariate Relationships

These tables include only those variables that are significant at 0.05. Complete tables are available upon request.

Table 1. Frequency of Lost-to-follow-up and Withdrawn from the 1,614 Grade 6 Baseline Cohort

Year of data collection	Lost-to-follow-up	Withdrawn	Found
1995–1996 (Grade 8)	47 (2.9%)	8 (0.5%)	1,559 (96.6%)
1997–1999 (Grade 11)	118 (7.4%)	25 (1.6%)	1,471 (91.1%)
2001–2003 (Young Adults)	263 (16.5%)	78 (4.9%)	1,270 (78.7%)

College Students: For both males and females, there were significant relationships with amount of money spent per week (more money is associated with greater likelihood of smoking), mother smokes, expectation of future smoking, friends behavior (greater involvement with tobacco, alcohol and other drugs), others smoking, stress, anger, risk taking (smokers reported more stress and higher levels of anger and risk taking), number of other tobacco products used and other drugs used, volunteering (smokers were less likely to volunteer), perceived health (smokers perceived themselves as less healthy), going to bars and having 5 or more drinks at one time. There were several variables that were related to male smoking that were not found for females, among which was parental highest level of schooling (smokers' mothers and fathers had lower levels), level of self-esteem and mastery (lower levels), depression (higher levels) and concern with weight (more likely to report that they were a little or much too heavy). For females, smokers were less likely to use languages other than English, were more likely to be white, were less likely to be involved in non-team sports, and to respond that religion was not that important to them.

Young adults not in college: Male and female current smokers were more likely than non-smokers to be white, have more money to spend each week, expect that they will smoke in the future, have a mother who smokes, friends who smoke and use alcohol and illegal drugs, work or play with others who smoke, experience more stress, have higher levels of risk taking, use other tobacco products and other drugs, think they are less healthy and drink more alcohol (go out to bars more often and consume more than 5 drinks on one occasion). In addition, female smokers were more likely than female non smokers to have fathers or sisters who smoke, have stronger positive attitudes toward smoking, scored lower on social conformity, and were less likely to attend a religious organization regularly. Male smokers were more likely to have brothers who smoke, scored higher on the anger and depression scales. They were also less likely to respond that religion was very or fairly important, and to be involved in organized team sports or in non-team sports.

Multivariable Analyses

College students: The multivariable models for males and females within each educational status group are different. For college students, four of the variables were in common—expectation of future smoking, friends smoking, number of tobacco products smoked and perceived health. For males, money spent, depression, volunteering and having more than five drinks entered the model. Conversely, for females, ethnicity was in the model, as was number of times going out to a bar. The accuracy of classification was high for both groups (males—90.5%; females—90.6%).

Not in college young adults: For those not in college, again there was some overlap in the multivariable models for males and females and there were discrepancies. For both genders, the amount of money spent per week was associated with smoking as was the expectation of continued smoking. For females, ethnicity (whites more likely to smoke), father smokes, times going out to a bar, perceived health, attitude and social conformity entered, while for males, friends smoking and number of tobacco products were in the final model. The accuracy of categorization was high for both groups (males—91.4%; females—90.9%).

Comparison of college and not in college groups: The models for males at both educational levels have four variables in common, while there were additional variables for those in college. For females, there were many more variables that entered for the not in college group with only three variables overlapping.

DISCUSSION

For all groups, males and females, non-college and college, the most important risk factor for current smoking is the expectation of smoking in one years time; i.e., the idea that they will be continuing smokers. The factors that lead to this expectation need to be determined because they will provide the basis for intervention programs aimed at reducing young adult prevalence.

Some gender differences emerged from the current multivariable analyses. Males, both non-college and college, share the variables of money spent, smoke one year from now, friends smoke and number of tobacco products. The regression coefficients for money spent and number of tobacco products are quite similar, whereas the coefficients of smoke one year from now and peers smoke are much larger for the not in college participants than for the college participants, yielding very large odds ratio of 141 and 4.5, respectively. In addition, the college participants have four more variables related to smoking.

The situation for females is more complex. The college and non-college participants share four variables, ethnicity, smoke one year from now, weekly times to a bar and perceived health. As in the males, these variables have far larger coefficients for non-college than for college, ranging from 4 to 300. In addition the college females have the variables friends smoke and number of tobacco products, as for the college males,

Table 2. Bivariate Analyses for Males in College

Variable	Smoking Status % or mean (SD) Non-current N=218	Current N=59	p-value
Money spent each week (dollars)	1.79 (0.75) n=216	2.22 (0.74) n=59	0.0001 n=275
Mother highest level of schooling			
1: Less than high school/Don't know	22 (10.09)	12 (20.34)	0.0333
0: At least high school	196 (89.91)	47 (79.66)	n=277
Does your mother smoke cigarettes?			
0: Never; quit	205(95.35)	52 (88.14)	0.0419
1: Occasionally; regularly	10 (4.65)	7 (11.86)	n=274
Father highest level of schooling			
1: Less than high school/Don't know	24 (11.32)	15 (26.32)	0.0043
0: At least high school	188 (88.68)	42 (73.68)	n=269
Is there a chance that you will smoke cigarettes one year from now			
1: I definitely/probably will not smoke	197 (90.37)	11 (18.64)	<0.0001
2: Don't know/I probably/definitely will smoke	21 (9.63)	48 (81.36)	n=277
How many of your friends smoke?	2.15 (0.77) n=218	2.98 (0.82) n=59	<0.0001 n=277
How many of the other people you know, through work or school, smoke?	2.43 (0.73) n=218	2.97 (0.79) n=59	<0.0001 n=277
How many of your friends drink alcohol (beer, wine, coolers, etc.)	1.97 (0.76) n=218	2.41 (0.56) n=59	<0.0001 n=277
How many of your friends use marijuana or other illegal drugs?	2.02 (0.97) n=218	2.86 (0.90) n=59	<0.0001 n=277
Self-esteem scale	4.07 (0.54) n=218	3.81 (0.63) n=59	0.0021 n=277
Life event/stress scale	10.46 (7.92) n=218	14.24 (9.34) n=59	0.0020 n=277
Level of mastery scale	2.58 (0.37) n=216	2.46 (0.41) n=58	0.0300 n=274
Anger scale	2.40 (0.90) n=218	2.83 (0.88) n=59	0.0013 n=277
Depression scale	1.00 (0.64) n=215	1.33 (0.72) n=59	0.0005 n=274
Risk taking Scale	0.43 (0.23) n=218	0.58 (0.21) n=57	<0.0001 n=275
Number of other tobacco products used	0.64 (0.88) n=218	1.52 (1.08) n=58	<0.0001 n=276
Number of other drugs used	0.66 (1.03) n=217	1.98 (1.63) n=59	<0.0001 n=276
Do you volunteer with any organization			
0: No	161 (73.85)	51 (86.44)	0.0430
1: Yes	57 (26.15)	8 (13.56)	n=277
Do you think you are			
0: Much too thin/A little too thin/Just about right	165 (75.69)	37 (62.71)	0.0466
1: A little too heavy/Much too heavy	53 (24.31)	22 (37.29)	n=277
Compared to other people your age which do you think you are?			
1: A lot healthier/A little healthier/ About the same	190 (87.16)	41 (69.49)	0.0012
0: A little less healthy/A lot less healthy	28 (12.84)	18 (30.51)	n=277
How many times a week do you usually go out to bars	0.94 (0.80) n=218	1.61 (0.56) n=59	<0.0001 n=277
How many times in the last 30 days have you had five or more drinks			
0: none	133 (61.01)	16 (27.59)	<0.0001
1: once or more	85 (38.99)	42 (72.41)	n=276

Table 3. Bivariate Analyses for Females in College

Variable	Smoking Status % or mean (SD) Non-current N=322	Current N=69	p-value
What language do you speak most often at home			
1: English	263 (81.68)	65 (94.20)	0.0102
0: Other	59 (18.32)	4 (5.80)	n = 391
Ethnic group:			
1: White	127(41.23)	47 (68.12)	<0.0001
0: Other	181 (58.77)	22 (31.88)	n=377
Money spent each week (dollars)	1.67(0.75) n=318	2.14(0.77) n=69	<0.0001 n=387
Does your mother smoke cigarettes?			
0: Never; quit	297(93.10)	55(82.09)	0.0038
1: Occasionally; regularly	22(6.90)	12(17.91)	n=386
Is there a chance that you will smoke cigarettes one year from now			
1: I definitely/probably will not smoke	291(90.37)	13(18.84)	<0.0001
2: Don't know/I probably/definitely will smoke	31(9.63)	56(81.16)	n=391
How many of your friends smoke?	2.07 (0.78) N=322	2.96 (0.88) N=69	<0.0001 n=391
How many of the other people you know, through work or school, smoke?	2.45 (0.71) N=322	2.99 (0.76) N=69	<0.0001 n=391
How many of your friends drink alcohol (beer, wine, coolers, etc.)	2.01 (0.76) N=322	2.45 (0.70) N=69	<0.0001 n=391
How many of your friends use marijuana or other illegal drugs?	1.99 (0.95) n=322	2.88(0.96) n=69	<0.0001 n=391
Life event/stress scale	12.10 (8.28) n=322	15.30 (8.71) n=69	0.0041 n=391
Anger scale	2.39(0.87) n=321	2.73 (0.87) n=69	0.0035 n=390
Risk taking Scale	0.39 (0.24) n=320	0.48 (0.21) n=69	0.0065 n=389
Number of other tobacco products used	0.26 (0.57) n=321	1.03(0.87) n=69	<0.0001 n=390
Number of other drugs used	0.51 (0.94) n=322	1.84 (1.32) n=68	<0.0001 n=390
Are you involved in non-team sports			
0: No	111 (34.69)	35 (50.72)	0.0126
1: Yes	209 (65.31)	34 (49.28)	n=389
Do you volunteer with any organization			
0: No	168 (52.34)	51 (73.91)	0.0010
1: Yes	153 (47.66)	18 (26.09)	n=390
How important is religion to you			
1: Very/Fairly important	188 (58.57)	28 (40.58)	0.0064
0: Fairly unimportant/Not at al important/Don't' know	133 (41.43)	41 (59.42)	n=390
Compared to other people your age which do you think you are?			
1: A lot healthier/A little healthier/ About the same	283 (87.89)	44 (63.77)	<0.0001
0: A little less healthy/A lot less healthy	39 (12.11)	25 (36.23)	n=391
How many times a week do you usually go out to bars	0.87 (0.77) n=322	1.51 (0.63) n=69	<0.0001 n=391
How many times in the last 30 days have you had five or more drinks			
0: none	223 (69.69)	24 (34.78)	<0.0001
1: once or more	97(30.31)	45(65.22)	n=389

Table 4. Bivariate Analyses for Males Not in College

Variable	Smoking Status % or mean (SD) Non-current	Current N=160	p-value N=150
Ethnic group:			
1: White	95 (60.90)	104 (73.76)	0.0186
0: Other	61 (39.10)	37 (26.24)	n=297
Money spent each week (dollars)	2.00 (0.82)	2.58 (0.64)	<0.0001
	n=160	n=149	n=309
Does your mother smoke cigarettes?			
0: Never; quit	135 (84.91)	108 (74.48)	0.0234
1: Occasionally; regularly	24 (15.09)	37 (25.52)	n=304
Do you have any brothers who smoke			
0: I have no brothers; No	119 (75.32)	95 (64.19)	0.0339
1: Yes	39 (24.68)	53 (35.81)	n=306
Is there a chance that you will smoke cigarettes one year from now			
1: I definitely/probably will not smoke	152 (95.00)	21 (14.00)	<0.0001
2: Don't know/I probably/definitely will smoke	8 (5.00)	129 (86.00)	n=310
How many of your friends smoke?	2.40 (0.86)	3.43 (0.74)	<0.0001
	n=160	n=148	n=308
How many of the other people you know, through work or school, smoke?	2.81 (0.81)	3.30 (0.68)	<0.0001
	n=160	n=148	n=308
How many of your friends drink alcohol (beer, wine, coolers, etc.)	2.02 (0.75)	2.35 (0.73)	<0.0001
	n=160	n=148	n=308
How many of your friends use marijuana or other illegal drugs?	2.49 (1.08)	3.04 (1.03)	<0.0001
	n=160	n=147	n=307
Life event/stress scale	12.56 (9.30)	8.58 (10.74)	<0.0001
	n=160	n=150	n=310
Anger scale	2.49 (0.97)	2.72 (1.05)	0.0385
	n=158	n=149	n=307
Depression scale	1.06 (0.61)	1.25 (0.72)	0.0122
	n=159	n=149	n=308
Risk taking Scale	0.51 (0.23)	0.59 (0.21)	0.0009
	n=157	n=149	n=306
Number of other tobacco products used	0.81 (0.99)	1.86 (1.03)	<0.0001
	n=160	n=150	n=310
Number of other drugs used	1.03 (1.43)	2.78 (2.09)	<0.0001
	n=160	n=150	n=310
Do you play any organized team sports			
0: No	99 (61.88)	155 (77.18)	0.0036
1: Yes	61 (38.13)	34 (22.82)	n=309
Are you involved in non-team sports			
0: No	72 (45.00)	84 (56.76)	0.0392
1: Yes	88 (55.00)	64 (43.24)	n=308
How important is religion to you			
1: Very/Fairly important	76 (47.80)	54 (36.24)	0.0401
0: Fairly unimportant/Not at al important/Don't' know	83 (52.20)	95 (63.76)	n=308
Compared to other people your age which do you think you are?			
1: A lot healthier/A little healthier/ About the same	141 (88.13)	110 (73.83)	0.0013
0: A little less healthy/A lot less healthy	19 (11.88)	39 (26.17)	n=309
How many times a week do you usually go out to bars	0.94 (0.82)	1.38 (0.67)	<0.0001
	n=160	n=150	n=310
How many times in the last 30 days have you had five or more drinks			
0: none	84 (52.50)	43 (28.86)	<0.0001
1: once or more	76 (47.50)	106 (71.14)	n=309

Table 5. Bivariate Analyses for Females Not in College

Variable	Smoking Status % or mean (SD) Non-current N=146	Current N=132	p-value
Ethnic group:			
1: White	76 (55.88)	105 (82.03)	<0.0001
0: Other	60 (44.12)	23 (17.97)	n=264
Money spent each week (dollars)	1.83 (0.78)	2.33 (0.77)	<0.0001
	n=144	n=132	n=276
Does your mother smoke cigarettes?			
0: Never; quit	127 (86.99)	85 (64.39)	<0.0001
1: Occasionally; regularly	19 (13.01)	47 (35.61)	n=278
Does your father smoke cigarettes?			
0: Never; quit	98 (72.06)	65 (57.02)	0.0129
1: Occasionally; regularly	38 (27.94)	49 (42.98)	n=250
Do you have any sisters who smoke			
0: I have no sisters; No	117 (80.69)	83 (63.85)	0.0017
1: Yes	28 (19.31)	47 (36.15)	n=275
Is there a chance that you will smoke cigarettes one year from now			
1: I definitely/probably will not smoke	132 (91.03)	13 (10.16)	<0.0001
2: Don't know/I probably/definitely will smoke	13 (8.97)	115 (89.84)	n=273
How many of your friends smoke?	2.29 (0.92)	3.39 (0.74)	<0.0001
	n=146	n=132	n=278
How many of the other people you know, through work or school, smoke?	2.78 (0.86)	3.15 (0.74)	0.0002
	n=146	n=131	n=277
How many of your friends drink alcohol (beer, wine, coolers, etc.)	1.92 (0.81)	2.33 (0.73)	<0.0001
	n=146	n=132	n=278
How many of your friends use marijuana or other illegal drugs?	1.98 (0.99)	2.82 (1.01)	<0.0001
	n=146	n=132	n=278
Attitude scale	-1.493 (17.76)	5.38 (19.70)	0.0034
	n=136	n=124	n=260
Life event/stress scale	14.26 (8.84)	19.17 (10.24)	<0.0001
	n=146	n=132	n=278
Risk taking Scale	0.44 (0.23)	0.54 (0.23)	0.0006
	n=146	n=131	n=277
Social conformity	2.24 (0.82)	1.93 (0.87)	0.0029
	n=146	n=128	n=274
Number of other tobacco products used	0.40 (0.69)	0.76 (0.86)	0.0002
	n=146	n=132	n=278
Number of other drugs used	0.91 (1.36)	2.33 (1.81)	<0.0001
	n=145	n=130	n=275
Do you attend a religious organization			
1: Never	59 (40.69)	76 (57.58)	0.0050
2: Daily/Weekly/Monthly/Only once in a while	86 (59.31)	56 (42.42)	n=277
Compared to other people your age which do you think you are?			
1: A lot healthier/A little healthier/ About the same	119 (82.07)	90 (68.70)	0.0097
0: A little less healthy/A lot less healthy	26 (17.93)	41 (31.30)	n=276
How many times a week do you usually go out to bars	0.76 (0.74)	1.39 (0.64)	<0.0001
	n=145	n=130	n=275
How many times in the last 30 days have you had five or more drinks			
0: none	103 (71.53)	46 (34.85)	<0.0001
1: once or more	41 (28.47)	86 (65.15)	n=276

Table 6. Multivariable Analyses for College and Non-college, Males and Females

Group	Smoking Status	Sample Size	Variable	Estimate	SE	p-value	Odds Ratio
College							
Males	smoker	n= 54	Money spent	0.6677	0.3584	0.0625	1.950
	nonsmoker	n=208	Smoke one year from now	3.7787	0.5511	0.0001	43.759
			Friends smoke	0.4736	0.2874	0.0993	1.606
			Depression	0.7955	0.3664	0.0299	2.216
			Number of tobacco products	0.5749	0.2620	0.0282	1.777
			Volunteer	-1.2169	0.6711	0.0698	0.296
			Perceived health	-1.8004	0.6334	0.0045	0.165
			Times drink more than 5 drinks	1.1246	0.5626	0.0456	3.079
Females	smoker	n= 66	White	0.8112	0.4527	0.0732	2.251
	nonsmoker	n=295	Smoke one year from now	2.8586	0.4136	0.0001	17.440
			Friends smoke	0.7786	0.2434	0.0014	2.178
			Number of tobacco products	0.4946	0.2531	0.0507	1.6400
			Perceived health	-0.9142	0.4685	0.0510	.401
			Times go out to bar a week	0.6260	0.3429	0.0679	1.870
Non-college							
Males	smoker	n=128	Money spent	0.6002	0.3494	0.0859	1.822
	nonsmoker	n=150	Smoke one year from now	4.9475	0.6144	0.0001	140.8
			Friends smoke	1.5064	0.3487	0.0001	4.510
			Number of tobacco products	0.4418	0.2239	0.0485	1.555
Females	smoker	n= 97	White	2.0319	0.7925	0.0103	7.628
	nonsmoker	n=112	Money spent	1.2119	0.4423	0.0061	3.360
			Father smokes	1.7525	0.7405	0.0179	5.769
			Smoke one year from now	5.6991	0.9001	0.0001	298.6
			Times go out to bar a week	1.4391	0.5050	0.0044	4.217
			Perceived health	-1.6024	0.9057	0.0768	0.201
			Attitude	0.0453	0.0181	0.0126	1.046
			Social Conformity	-1.0717	0.4809	0.0258	0.342

whereas the non-college females have money spent, father smokes, attitude and social conformity, which they share with no other group. Thus the college females share some characteristics with the non-college females and others with the college males, but the non-college females, although having some risk factors in common with the college females, have other factors quite distinct from all other groups in the study. It is not obvious to us why this pattern has resulted; however, it may be that the young adult females are dealing with very different life experiences than the other groups.

It has been documented that educational attainment is a strong predictor of smoking, with those with lower levels of attainment being more likely to smoke than those with higher levels of attainment. Educational attainment is typically defined as completed achievement and the conclusions about the relationship of education and smoking are generally based on analyses of adults with different educational levels.[41,42] Few studies, such as Astone et al.,[43] analyzed the relationship between smoking status and education level for young adults between 18 and 24 years of age. Other studies have been conducted only among college students.[44] In the case of the current analyses, we were interested in comparing the smoking status and relationship to other variables among those who were either currently in college or currently not in college.

There are some limitations to this study. First, as in all cohort studies, there have been losses to follow-up. However, in this case, the follow-up is nearly 80% of the original group. Second, there may have been other measures that could have been included in the study, such as personal experience with health issues. The measures used were those that were included in the original study. The focus groups provided a basis for modifying those measures and discussions focused on additional topics that could have been included. An effort was made to incorporate all of the factors that were noted in these discussions. Third, the individuals who participated in this latest follow-up may not be representative of all young

adults either in Canada or in the province of Ontario. Potential bias has been assessed in two ways 1) by comparing sociodemographic variables for the parents of Grade 11 participants with the 1996 census figures for Scarborough and Ontario,[45] and 2) by comparing the young adults with the 2001 census data for ages 20–24 in Ontario.[46]

We compared the parents of the participants with regard to proportion of single-parent families, completion of high school or less, unemployment and smoking. As would be expected, the parents were similar to the Scarborough population but were somewhat different from the province of Ontario as a whole, with the prevalence of single-parent families and the unemployment rate being slightly higher in this sample than in Ontario. The percentage of single-parent families in Ontario is 14.4% and for Scarborough 19.1%, while in our sample the rate was 17.8% (CI = 15.8%, 19.7%). The percentage of the population of Ontario who are unemployed is 11.3% and for Scarborough is 14.2%, while in our sample it was 13.9 % (CI = 12.7%, 15.2%). The reported rate of parental smoking in our sample, is 22.8% (CI = 21.2%, 24.4%), with the prevalence of smoking for adults in Ontario, 25.0%,[47] revealing that parents of the participants in our study were slightly less likely to smoke. Since the Ontario figure includes many people younger than the parents, the parental prevalence should be lower. Given the relationships known to exist between parental education, employment and smoking, and youth smoking behavior, one would expect more smoking in the whole population than in this group of participants. Hence, the distributions are truncated, and if the group were more representative of the general population, the relationships would probably be stronger than those found.

For the young adults, comparisons were made with regard to gender, employment status, enrollment in school, and marital status. In our sample, significantly more of the group were attending school (76.8%, CI = 74.5%, 79.2%) and significantly more were unemployed (29.9%, CI =27.4%, 32.5%) than those in the province (51.8% and 14.6%, respectively) for this age group. These two variables may be related in the sample, with school attendance possibly precluding employment. The proportion of males in our study (46.9%, CI = 44.1%, 49.6%) was lower than the proportion of males of this age group (50.1%) in Ontario in 2001. The proportion of unmarried individuals in this study (93.1%, CI = 91.7%, 94.5%) was higher than that in Ontario (91.1%) for this age group. Comparison of current smoking prevalence of 32.8% (CI = 30.3%, 35.4%) with the rate for ages 20–24 in Ontario[48], 31.2%, revealed that the prevalence of smoking was slightly higher in our sample.

In order to compare those who responded as young adults with non-respondents, we contrasted their answers to the grade 6 baseline questionnaire. There were no statistically significant differences between the groups on grade 6 smoking status or on any of the psychosocial variables with the exception of the overall attitude scale ($p= 0.009$). Respondents (mean score 9.63) had less favorable attitudes toward smoking in grade 6 than did non-respondents (mean score 10.43). Females were more likely to respond ($p\leq0.001$) as were those who had less money to spend ($p = 0.018$) in grade 6, who had fewer friends who smoked ($p = 0.017$), who lived with their parents most of the time ($p < 0.001$) and those whose parents didn't smoke ($p = 0.002$).

The results of this study provide some guidance about what types of interventions may be effective for different groups of young adults. Given the pattern of the findings for college and not in college young adults, and the sex differences that were found, programs designed for prevention and cessation need to be designed specifically for the target population. For example, all of the groups of smokers had higher levels of stress and depression than their non smoking counterparts. So interventions aimed at helping people deal with these factors might be in order. However, in the multivariable models, the only group that included one of the variables in the final model was the college males who had depression in their model. We have discussed the idea that this factor may be more important for this group than the others and should be addresses in prevention and cessation interventions.

In-depth analyses of the risk factors for smoking may provide information on the causes of smoking and on what types of interventions might be effective. The use of qualitative interviews and focus group help may help to provide some explanations for the differences noted. Before any effective interventions can be designed, it is essential to better understand the underlying mechanisms. What seems apparent at this point in time is that targeted interventions may be necessary.

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